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ABSTRACT

Two sixth-grade, hearing-impaired students were studied to determine the effectiveness of stress management techniques using biofeedback instruments to monitor their nervous and cardiovascular systems. The male student had behavior problems, exhibiting explosive behavior without warning. The female student experienced excessive audible inhalations during reading recitations and expressive language-producing situations. The students were taught appropriate breathing techniques, self-regulatory skills for skin temperature feedback and charting, relaxation training, and use of galvanic skin resistance electrodermal response instruments. Results of the project showed that stress management training using biofeedback can be successfully implemented with hearing-impaired students. The male student improved his conduct ratings from unsatisfactory to satisfactory, and the female student's inhalations were decreased to within the normal range. Other project goals, which were achieved to varying degrees, included decreasing self-reported stress, improving self-image, decreasing electrodermal responses, and increasing average peripheral temperatures to the normal range. (Author/JDD)

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NOVA UNIVERSITY

Implementation of Biofeedback Techniques To Reduce Stress Involving Communication Skills With Elementary School Hearing Impaired Students

by

Tonyia J. Litus

Cluster XXVII

A Practicum Report Presented to the
Ed.D. Program in Early and Middle Childhood

NOVA UNIVERSITY

1988

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PRACTICUM APPROVAL SHEET

This practicum took place as described.

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June 21, 1988

This practicum report was submitted by Tonyia J. Litus under the direction of the adviser listed below. It was submitted to the Ed.D. Program in Early and Middle Childhood and approved in partial fulfillment of the requirements for the degree of Doctor of Education at Nova Uniiversity.

Approved:

5/23/88
Date of Final Approval of Report

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ABSTRACT

Implementation of Biofeedback Techniques to Reduce Stress Involving Communication Skills with Elementary School Hearing Impaired Students. Litus, Tonyia J., 1988: Practicum Report, Nova University Ed.D Program in Early and Middle Childhood.
Descriptors: Stress Management/Deaf/Hearing Impaired/Relaxation/Training/Biofeedback/Communication/Behavior Change.

This practicum addressed the need for teaching students how to manage stress and deal more effectively with stress producing events in a socially acceptable way. One elementary school student has had behavioral problems for several years, with explosive behavior without warning. Another elementary student experienced excessive audible inhalations during reading recitations and expressive speech producing situations.

The author's goals were to examine the effects of implementing stress management techniques with two sixth grade, hearing impaired students individually using biofeedback instruments to monitor the nervous and cardiovascular systems over a three-month implementation period. The specific objectives were: (1) to improve ratings on two six week report cards from unsatisfactory (U), to needs improvement (N), to satisfactory (S) for the male hearing impaired student; (2) to decrease the female hearing impaired student's audible inhalations per minute by 80%; (3) improved self-image with both students; (4) to reduce daily stress by increasing peripheral temperature to the normal range of 92 degrees to 96 degrees; (5) to decrease the electrodermal response from the initial baseline to the final baseline by 50%; (6) to decrease pre - and post session self-reported stress, based on a scale of zero (no stress) to ten (extreme stress), to the lower limits (zero to five); (7) to reduce scores on the Taylor Manifest Anxiety Scale post-test to a score of 19.

An analysis of the results showed that stress management skills and training can be successfully implemented with hearing impaired students. The first objective to decrease general conduct ratings with the hearing impaired male student from unsatisfactory to satisfactory was achieved. The second objective, to decrease the female student's audible inhalations per minute by 80%, based on the norms established by two speech and hearing pathologists.

The final score exceeded the goal, placing the student's inhalations within the normal range. The third objective, to improve self-image remained the same for the male student and increased to the next percentile for the female student, thus achieving her goal. The fourth objective was for each student to reduce daily stress. One goal of this objective was to increase average peripheral temperature to the normal range of 92 degrees - 96 degrees. Neither student met this goal, but improvement was indicated for each. The male student's range was 75 degrees to 94 degrees with a beginning average of 84.2 degrees and final average of 86.4 degrees, or 2.2 degrees average increase. The female student's range was 84 degrees to 95 degrees, with a beginning average of 84.1 degrees and final average of 90.6 degrees or an average increase of 6.5 degrees. The second goal of this objective was to decrease the electrodermal response from initial baselines by 50%. The male reached the goal with a 52% reduction , while the female's responses decreased by 19%. Self-reported stress was reduced to the lower 50% range of stress relaxation scale by both students as the third goal within this objective. The fourth goal was to reduce anxiety scores, which both students achieved. Both showed improvement though they varied with goal achievements. The findings suggest that biofeedback techniques are beneficial to hearing impaired students and can be implemented within the school setting.

CHAPTER I

INTRODUCTION

Description of Community

The south area of the county is supported by high technological industries and electronics as a reflection of a space center program. There is a diversified base of industry including electronics, aviation, light manufacturing, opticals, communications and agriculture. A small private technological university attracts students throughout the world. An air force base is also located in the region.

Growth in the area has been rampant in the last few years due to the attraction of various technological corporations. Manufacturing employment has tripled in the past ten years.

The south area is ranked as the ninth fastest growing metropolitan area in the United States, according to the U.S. Census Bureau. There are ten Fortune 500 companies located in the southern portion of the county.

The county, with a total of 357,033 population, is located along 33 miles of coastline in the state which attracts a winter population of tourists who visit beaches for short vacations, as well as those who reside in the area for the winter months. Thus, the population of the south area increases from 183,002 in the summer to nearly

200,000 during the winter since the temperature remains mild.

The Author's Work Setting

Because of its' unusual size and shape, the county is divided into three areas which are the north area, central area and south area. The school system in the south area of the county consists of nearly 14,000 students in elementary schools and 12,000 in secondary schools. There are approximately 1500 teachers or forty nine percent of the entire county school staff located in the southern portion of the county.

Teachers of the hearing impaired throughout the county consist of four hearing resource clinicians working with approximately 35 mainstreamed students. One middle school teacher, one high school teacher, and four elementary school teachers work with approximately 25 self contained students. A lead teacher for low prevalence students supervises the teachers and clinicians throughout the county and conducts staffings for new students as well as three year evaluations of previously staffed students. Speech and language pathologists provide therapy for all self contained students and for mainstreamed students as needed.

The Author's Role and Responsibilities

The writer's current title is that of a Hearing Resource Therapist who travels to mainstreamed hearing impaired student's schools where they meet individually for as long or as often as appropriate to the student's needs.

An individual education plan (IEP) is developed annually for each student with parents, teachers (special education and regular) and appropriate administrative figures (psychologists, principals, curriculum coordinators, etc.)

Services available to the students include; consultation to teachers, staff, parents, and adjunctive support systems (ex. speech and language pathologists, audiologists, otolaryngologists, etc.).

Hearing Resource Therapists also provide counseling, academic reinforcement, auditory training, speech reading, sign language and interpreting (oral or sign language). Ages of students range from birth to nineteen years of age.

In addition, the writer has a part time private practice as a psychotherapist in the community, specializing with services to the hearing impaired as well as to hearing individuals. Biofeedback has been successfully implemented with both populations.

Counseling services are also provided for patients of a local otolaryngologist who are undergoing cochlear implants. The writer has an undergraduate degree in psychology and two Master's degrees, one in audiology and the other in counseling psychology.

The writer has twenty years of experience in deaf education and was one of three founders in the community to develop a deaf association for deaf children and adults. The purpose of the organization is to provide equipment to the hearing impaired in order to assist with improvement of their lifestyles. Interpreting services is another valuable function provided by this group. Examples of needed equipment include: teletype devices (telephones for hearing impaired); television decoding devices which print what is being said on designated television programs; doorbell flashers; alarm clock flashers or pillow vibrators for awakening; fire alarm flashers as well as flashers installed in a deaf parent's room to alert them of a crying child in another room; hearing aids, batteries and repair services on all equipment.

The writer has been a presentor of stress management workshops to the general public and to school system employees, as well as a guest speaker on local radio and television stations, and medical conferences within the United States.

CHAPTER II

STUDY OF THE PROBLEM

Description of the Problem Situations

A male, hearing impaired, mainstreamed, sixth grader had been reported by the teacher, principal and parents as displaying ongoing behavior problems. The student was caught by school authorities skipping school with another student. The principal stated that the student had been reprimanded several times during that grading period for talking back to teachers as well as for causing disturbances by getting into fights with peers. The parents further reported similar behavior taking place in the community with neighborhood children, plus running away from home on several occasions. In speaking with previous teachers of this student, it appeared that the behavior described had been escalating since his arrival four years ago.

A speech and language pathologist reported a female, hearing impaired, mainstreamed, sixth grade student as exhibiting inappropriate breath control for intelligible speech production. Speech description included rapid speech production; inappropriate phonation during inhalation rather than exhalation; nonstressed syllables with monotone production; and numerous, quick, short breath intakes while reading and reciting.

It appeared that these students had very little management over stressors relating to controlling behavior or breathing patterns. If they could have acquired such skills, perhaps arguments with teachers and peers would have decreased for the male sixth grader and rapid speech production could have decreased for the female sixth grader. Appropriate phonation during inhalation could improve for her as well.

The problems addressed in this practicum were that a male sixth grade hearing impaired student had problems with self control of behavior and a female sixth grade hearing-impaired student produced rapid speech due to inappropriate breath control.

Evidence of the Problems

In order to document the problems previously stated, the writer utilized several inventories intended to document presence of stress in each student's life.

Pre-measurement of audible inhalations per minute was assessed by the speech and language pathologist for the female student. In order to establish a norm, twelve sixth grade students were selected by two speech pathologists. Each pathologist at separate locations, tallied total inhalations per minute of six students.

Identical passages from a previous fourth grade reader (350 words) was used. Average inhalations for the twelve students were 32.5 per 350 words or 10 per 100 words (See Appendix A). The hearing impaired student's score was 47, which exceeded the norm.

The Meadow-Kendall Social Emotional Assessment Inventory for Deaf Students was completed by the classroom teacher for each student. The pre-test for the male sixth grader revealed below average scores for social adjustment (10th percentile), self-image (below 10th percentile), and emotional adjustment (20th percentile). The female sixth grader's scores were above average for social and emotional adjustment (80th and 90th percentiles), with a below average score for self-image (20th percentile.)

Coopersmith's Behavioral Academic Self-Esteem Rating Scale (BASE) was also completed by the classroom teacher of each student. Results of the pre-test for the male was a total BASE score of 35 which is quite low and 64 for the female which was normal and above. Both students had low scores in the specific area of self-confidence.

The Taylor Manifest Anxiety Scale was completed by each student. The results for the female placed her in a mild to moderate range for stress, while the results for the male ranked him in the higher than average range for anxiety effects.

The Physical Stress Symptom Scale pre-test found the male functioning in the moderate range for physical stress symptoms, with the female functioning in an average range for physical stress symptoms.

Elkind's Stress Test for Children, which is similar to the Holmes-Rahe Life Events Questionnaire, was administered to each student in order to determine the impact of stress in each student's life. The male student's score was 429 which placed him in the range of "strong likelihood of change in behavior or health." The female's total score was 290, placing her in the range of "better than average chance of showing stress symptoms."

The general conduct grades for the male during the first marking period was "N" (needs improvement) and for the second marking period, a "U" (unsatisfactory) which were given by the classroom teacher.

Analysis of the Causes

The problems of these students experiencing stress in conjunction with behavior and speech production could have had many causes. One cause of the problem may have been the lack of communication skills due to their hearing losses. Communication barriers could have had a substantial impact in the development of interpersonal skills.

Another cause of the problem may have been poor self-concepts which could have been involved with appropriate behavioral functioning and low academic achievement.

A third reason might have been the lack of understanding emotions and expression of them in an appropriate manner. This too could be related to the lack of communication skills on a personal level.

The fourth reason for the problem could have been depression which might have been caused by self-anger which could have interfered with academic and social functioning. In turn, this could also have resulted in reduced self-esteem.

Whatever the causes may have been, these two students were in need of corrective measures in their lives. Gaining skills in stress management to apply to their individual stressors could also have increased self-esteem, which in turn could possibly have improved other areas of their lives as positive side effects.

The Relationship of the Literature to the Problem

Literature was reviewed in order to help solve the problem of reducing stress with hearing impaired students. The literature supported the fact that hearing impaired students experience a great deal of stress in regards to their lack of communication skills.

Loeb and Sarigiani (1986) found that hearing impaired subjects have lower self-esteem and related problems in self-confidence, peer and family relations, as well as academics. Communication barriers often appear to be a source of the problems. The communication gap often causes frustration and stress. Their research indicated that (1) hearing-impaired children in mainstreamed settings have self-perceived problems with peer popularity; (2) communication deficits create social isolation which fosters shyness, often creating a vicious cycle for the child; (3) academics can be greater challenge for them due to their hearing loss which can result in a lack of confidence in their abilities.

Meadow (1980) discussed self-concept studies with the deaf as having theoretical significance and practical implications for the treatment of deaf children. Some of these theoretical issues have been suggested by the literature: (1) consequences for self-concept development resulting from the delay of language acquisition; (2) the relationship between language and thought; (3) influences as a result of the lack of early parent-child communication regarding self-concept; (4) the influence of deficient language on the child's ability to develop trust and the consequences for self-esteem; and (5) the

relationship between negative views of the handicap by society and the development of self-esteem.

The well-adjusted deaf child was described by Watts (1979) as one who, in spite of communication problems, has developed a satisfactory self-image. He approves of himself and what he does and expects others to do the same. This implies a state of equilibrium as opposed to conflict with self and others. The socially adjusted deaf child is aware of what is expected of him in his environment. He takes pleasure in establishing good relationships. Anti-social behavior should be temporary which might be caused by inadequate communication.

The gap in communication is a source of frustration and stress. The hearing impaired child tends to become isolated in his own home, often not experiencing close contact with parents and family, thus lacking close emotional ties or the experience thereof (Vernon, 1974).

Convy (1981) cited conclusive evidence for the relationship between self-concept and achievement, with achievers having a higher self-concept. The relationship between achievement and locus of control is not as conclusive. Such research that has involved deaf subjects, has generally examined differences between the deaf and hearing groups. Results have suggested that deaf

subjects tend to be more externally controlled and to have lower self-concept.

Farrugia and Austin (1980) described the problems of low self-image and poor peer acceptance as being greater for mainstreamed students than for residential students. Mainstreamed students experience self-perceived problems with peer popularity. In addition, they see themselves as having difficulty making friends and getting along with others. Peer relations are rare and aversive. They are often picked on by hearing peers. Shyness is another peer related issue with the lack of popularity, which is magnified by communication problems. These factors become a vicious cycle for the hearing-impaired child. They acknowledge communication barriers as being a problem and seem to accept it.

The nature of the deaf child's self-image and the development of the self-concept and the acquisition of language are important in both theoretical and practical aspects of deafness (Schlessinger and Meadow, 1972). Language, as it relates to the self, is central to the sociological perspective of symbolic interaction. The self can become an object to itself by the manipulations of symbols through the use of language. The individual can make symbolic indications to himself from previous

experiences. The self is a social self that grows through contact and interaction with others. The individual interprets the actions and reactions of others. The deaf child becomes aware as he grows older that the world sees him as different, that most people are not deaf and that the adult occupational and educational world is geared to hearing people.

Immaturity is a normal trait common to deaf persons. Adjustment to deafness often consists of resentment and bitterness about the reality of their handicap which is often seen as stronger in day school settings. There they are constantly reminded by families and peer groups that they are different from the others (Rosenberg, 1979).

Gregory (1986) found in his study that disabled students reported having more school-related problems and stress, doing less homework, having lower work orientations and career aspirations than non-disabled peers. The handicapped students reported lower estimates of self-concept and adjustment and significantly higher frequency of legal problems. Not only did the handicapped students experience greater academic difficulties but their responses suggested more serious personal problems, lower self-esteem and lower motivation.

Sarfaty and Katz (1978) studied the influence of educational settings on the self-concept and emotional adjustment of hearing-impaired children. They found that with more integration, students may have more adjustment problems because the hearing-impaired child would need more communication skills with his hearing peers. This problem creates more anxiety, frustration and stress.

Watts (1979) believed that deaf children's difficulties in dealing with other people and with themselves can result in affective disabilities which may retard cognitive functioning. Deaf children who communicate inadequately experience frustration, depriving a basic need for interpersonal interaction and a source of self-expression and self-realization. The deaf child, lacking language experience, is often caught up in the emotional states of dependency, aggression, and anxiety in a much more intense way than his hearing peers. The deaf child, who cannot overhear, is cut off from many aspects of superego enrichment of the developing self-identity.

Foster and Szoke (1977) suggested that having the confidence and motivation to achieve in the education and occupational areas, to acquire self-help skills, and to engage in social relationships is greatly influenced by one's self-concept.

Convey (1981) examined differences between deaf and hearing groups. The findings of this research suggested that, in comparison to hearing subjects, deaf subjects tend to be more externally controlled and to have lower self-concept. In addition, in comparison to deaf students born to hearing parents, deaf students born to deaf parents have a higher self-acceptance and are better achievers.

Loeb and Sarigiani (1986), Watts (1979), Foster and Szoke (1977) and Convy (1981) hypothesized factors regarding frustrations, self-esteem and self-confidence which might influence hearing-impaired children's successful academic achievement. All suggested that the idea of self-acceptance is related to better achievement.

According to Zipkin (1985), relaxation exercises have been used effectively with handicapped children as an intervention instrument for behavior management. Techniques such as progressive muscle relaxation, imagery, music, breathing control, and biofeedback training have been applied with successful results to decrease hyperactivity and impulsivity, improve academic achievement, increase attention span, and improve communications and interpersonal relationships.

In conclusion, a review of the literature indicated

that the mainstreamed hearing-impaired student experiences a great deal of stress with communication barriers in his educational and social lives, with the end result being lowered self-esteem and self-concept.

CHAPTER III

ANTICIPATED OUTCOMES AND EVALUATION INSTRUMENTS

Goals and Objectives

At the conclusion of three-month implementation period, the two hearing impaired students were to have acquired stress management skills that would enable them to deal with stress in a more effective way.

The first goal of this practicum was to teach the students about stress and stressors and then to have them identify stressors in their own lives. The second goal was to inform them about biofeedback and its' application for stress. The third goal was the consistent usage of biofeedback and stress management techniques on a weekly basis at school and at home. The fourth goal was that as a result of assimilation of biofeedback skills in their lives, improved behavior would occur for the male student and a reduction of audible inhalations for the female student.

Behavioral Expectations

The following behavioral objectives were selected for the three-month practicum experience.

Description of Assessment Instruments

	Expected Behavior	Evaluation Tool	Standards of Performance
1.	improved behavior (male)	two six week report cards	from "U" to "N" to "S"
2.	decreased audible inhalations (female)	post assessments by speech therapist	decreased by 80% (see Appendix A)
3.	improved self-image (both students)	Meadow/Kendall assessment inventory post-test by teacher	increase to the next 10th percentile in post assessment
4.	reduction of daily stress (both students)	(a) weekly chart of temperature feedback per session	(a) average increase of peripheral temperature to normal range of 92 degrees -96 degrees
		(b) weekly chart of Electrodermal Responses (EDR) per session	(b) decrease from individual baseline by 50%
		(c) pre-and-post session self-report by students	(c) decrease to lower limits of scale (0-10 range)
		(d) Taylor Manifest Anxiety Scale post-test by students	(d) reduction of score to 19 (no more stress than average person)

The students would have acquired biofeedback skills for monitoring peripheral temperature changes and its' relationship to stress and relaxation (see Appendices B and C)

Description of Biofeedback Instruments

One of the ways the body responds to stress is through the skin and what scientists call galvanic skin resistance (GSR). This is a reflection of variations in sweat gland activity and pore size, both of which are controlled by the sympathetic nervous system. Skin resistance increases when one is calm and relaxed and decreases when even slightly tense. The GSR 2 is an automatic, portable device. Fingers are placed on the sensing plates, then the dial is turned until a tone is heard. When one begins to become relaxed, skin resistance increases and the tone lowers. When one becomes stressed, skin resistance decreases and the tone increases. (Most frequencies could be detected by the students when wearing their hearing aids.) As the tone diminished, the dial was reset to a lower number. Notations were then made of the numbers during each three minute segment of the session. Time was monitored with use of egg timer as a visual reminder to the students and author, in order to maintain consistency throughout.

Another way the body responds to stress is through blood flow. Skin temperature is measured by way of a precision sensor that detects the temperature of the underlying tissue. The temperature changes as a function of the amount of blood perfusing the tissue. The arterioles which supply blood to the peripheral tissues are surrounded by smooth muscles. These are innervated by the sympathetic nervous system. When there is sympathetic arousal, the muscles constrict, causing vasoconstriction which reduces the amount of blood flow into the peripheral tissues. The temperature of these tissues then decreases. When the smooth muscles are relaxed, or a reduction of sympathetic activity, the arterioles expand or vasodilate. The peripheral blood flow increases and the temperature of the surrounding tissues increases.. Thermal biofeedback can provide information regarding the peripheral vascular activity levels of sympathetic arousal.

The Temp/SC 200T was the selected device for monitoring skin temperature. A temperature probe was attached to the volar surface of the distal phalange by a velcro band. A digital reading was displayed indicating the absolute temperature of the fingertip. An inverse proportional tone pitch for feedback could be used. The

tone decreased when the temperature went down and vice versa. The skin temperature was also timed by the egg timer (three minutes). The temperature was charted per segment. The shorter the amount of time required for changing peripheral temperature per degree, the more control the student was acquiring over stress. Skin conductance was also observed with this device for specific digital readings which were charted. Spectra 360 electrode gel was used with each attachment.

Analysis Procedure

A cumulative chart (Appendix D) indicated any changes with temperature, electrodermal responses, pre-and-post session relaxation levels, as well as relaxation levels achieved during homework. A comparative chart of all pre-and-post assessments would indicate appropriate reductions and increases in scores, according to the standards of performance previously described.

CHAPTER IV

SOLUTION STRATEGIES

Discussion and Evaluation of Possible Solutions

Studies using hearing impaired subjects and stress management skills using biofeedback were not found in the survey of literature. Normal children and some other exceptionalities have been subjects in recent years.

One such study conducted by Zaichkowsky (1984) with regular fourth grade children found that they can learn to control "fight or flight" responses by practicing a program which included instruction of proper breathing, progressive muscle relaxation, visual imagery and temperature feedback. The purpose of the study was to determine whether normal elementary school-aged children trained in temperature biofeedback assisted stress management could demonstrate control of stress responses. It concluded that biofeedback assisted stress management is appropriate for the elementary school curriculum.

Carter (1983) completed a three-year project in order to determine whether a biofeedback/relaxation training program could be implemented in public schools for learning disabled children by public school personnel. The teachers achieved significantly better results with the children when using relaxation tapes rather than the

electromyograph (EMG) instruments to train them to relax. The results indicated the viability of biofeedback/relaxation training for improving academic functioning in learning disabled children.

Relaxation training was demonstrated to be effective in a study done by Carter (1974) with learning disabled and emotionally disturbed children while increasing cognitive, achievement, and psychomotor abilities of learning disabled and emotionally disturbed children. The areas of greatest deficit were where the children showed the greatest gains. If appropriately implemented, the program can bring about significant positive changes in academic performance. Once the improvements are made, they continue to accrue with time.

Matthews and Castell (1984) conducted a study utilizing relaxation training in conjunction with temperature biofeedback. Autogenic training, visual imagery and quieting reflex (QR) were techniques implemented during the study. Pre-and-post temperature readings were recorded per relaxation session. Results indicated that students receiving the training experienced a reduction of behavior problems.

Engelhardt (1978) found that analysis of electromyographic (EMG) and hand temperature feedback pre-and-post measurements of participants significantly decreased anxiety levels and increased self-concept scores. Students obtained low frontalis muscle-tension levels and increased hand temperatures during public school classroom instruction.

Studies using relaxation procedures have experienced various successes with children in educational settings. Temperature feedback is easy for children to understand and is cost effective, as well as easily implemented. Autogenic, progressive relaxation and visual imagery tapes or scripts are likewise easily implemented and inexpensive.

Description of Selected Solution

The selected solution to the problem of stress reduction with two hearing-impaired students included temperature feedback and electrodermal feedback once an introductory period of defining stress and locating stressors and personal psychophysiological responses for each student was completed.

Results of the Taylor Manifest Anxiety Scale, Physical Stress Symptom Scale and Elkind's Stress Test for Children (see pages 7 and 8) were discussed with each student.

Baseline information was then acquired through a tape developed by the author which allowed for periods of relaxation and introduction of stressors as subtracting series of sevens from 100 quickly by use of memory. Other stressors included sounds of a baby crying, telephone ringing, a thunderstorm, and a stalling car engine. The baseline was established while students were connected temperature and electrodermal instruments. This procedure was repeated at the end of the three months for comparative analysis (see Appendix D).

Appropriate breathing techniques were introduced. Students learned the differences between diaghramatic breathing, thoracic breathing and stressed breathing patterns. Students observed movement of a foam rubber cube attached to an elastic band with velcro closure from various locations and positions of the chest and stomach which first were modeled by the writer, then duplicated on selves. Students combined visual imagery with this procedure, by visualizing disposing dirty water from a glass and filling it with clean water and also filling a balloon (lungs) with air and releasing the air from the balloon while watching it deflate in slow motion.

The students then learned self-regulatory skills of skin temperature feedback and charting (see Appendix C)

along with the explanation of biofeedback temperature training. Liquid thermometers were used for one week of homework, monitoring temperatures at various times each day, noting where they were, what was happening and how they were feeling on a scale from zero (very relaxed) to ten (very tense). Later they recorded their pre - and-post levels of relaxation skills once they were acquired.

Thermo-dots were used in order to create various experiences and reduce boredom. These dots are small disks coated with thermochromic liquid crystals which change colors in accordance with temperature changes. A color chart displays corresponding colors and temperatures, for example:

Color showing:	Red-Tan	Orange	Yellow-Green	Blue-Green	Blue
Temperature (degrees in farenheit)	85	87.5	90	92.5	95

Along with those techniques previously described, diaghramatic breathing, positive thoughts and "letting go" of tension by allowing it to drift through the body and drain through imaginary outlets in the bottom of the feet were practiced. They also were taught to use signals or cues in their daily lives to foresee stress and become aware of stress. Examples of cues they decided were appropriate were: at the water fountain, restroom, taking a test, reading, or when beginning to feel angry or upset. Following each body check, they would take their diaghramatic breath, think of warmth and heaviness in their arms and hands, imagine a positive picture, take another breath and go on with their day. This was to be done twice daily and as needed.

Relaxation training was taught to the students, through use of Peace and Harmony (Lupin, 1977) tape series and an appropriate environment of a dimly lit room and comfortable chair or floor mat. Ten tapes were used from this series in order to help the students to identify tension by experiencing contrasting feelings of tension and relaxation; teaching students to relax in everyday situations; and teaching visual imagery by using the five senses; and imagination in various settings, as the beach, the woods, the mountains, outerspace, etc. An example of

imagery, using the beach scene and the five senses, would be: to taste the salt on the lips; feel the cool breeze and sea spray on the skin; feel the texture of the sand and the warmth of the sun on the skin; hear the pounding surf and the seagulls; smell the salt air; and see the deep blue color of the water, contrasted by a light blue sky with white clouds, white seafoam, seagulls and sand. In addition, phrases were read periodically to students and by students (see Appendices E and F).

Progressive relaxation was another technique that was presented and practiced by each student. Through this exercise, students learned the difference between what very tense and very relaxed feelings are like in their own body (see Appendix G).

The galvanic skin resistance (GSR) electrodermal response instrument (GSR 2) as well as physiological explanations were introduced, along with charting and training. Guided imagery techniques were adjunctive to this therapy. Students practiced using all five senses to create their own personal images appropriate for stress reduction.

Incentives for reaching individual goals set periodically by each student throughout the three-month

implementation included packets of trail mix, sugarless gum, and ice cream sandwiches. These were particularly motivating with getting homework completed and turned in or time, thus adhering to the time schedule.

Written permission had been acquired from parents (see Appendix H) and principals prior to implementation. Information was disseminated to the parents, principals and later to appropriate teachers regarding biofeedback and stress management (see Appendix I). Teachers were unaware of the practicum until its' completion, thus strengthening pre - and - post evaluation results by their not feeling pressured to perform, or to please the author.

Calendar Plan

1. Week 1

   (a) Introduction of concept and definition of stress with physical and mental manifestations.

   (b) Identified individual stressors with life event survey.

2. Week 2

   (a) Introduced temperature and electrodermal instruments to students, with explanation of psychophysiological manifestations.

   (b) Acquired baseline information of temperature and electrodermal (EDR) readings under both relaxed and stressed conditions, using tape made by author.

3. Week 3 and 4

   (a) Introduced diaghramatic breathing to students as well as thoracic and stressed breathing patterns and their differences.

   (b) Students developed cues for daily diaghramatic breathing.

4. Week 5

   (a) Introduction of the progressive relaxation technique with tapes and verbal scripts.

   (b) Students practiced without presented scripts, developing their own.

5. Week 6

   (a) Applied self-regulatory skills in skin temperature feedback with student setting own goals.

   (b) Students and writer charted temperature and relaxation levels each session.

6. Week 7

   (a) Introduced autogenic relaxation skills using tapes and verbal scripts.

   (b) Goals were set for raising finger temperature for five minutes, then two minutes by students.

7. Week 8

   (a) Introduced usage of visual imagery with tapes and prepared scripts.

   (b) Students developed own imagery scripts using all five senses.

8. Week 9

   (a) Students developed personal coping skills routine, utilizing those techniques presented.

   (b) Continued imagery development.

9. Week 10

   (a) Summarization of all material covered.

   (b) Summarization of all techniques covered.

   (c) Monitored usage of imagery.

10. Week 11

   (a) Post stress baseline evaluation.

   (b) Summarization of all charts.

   (c) Post evaluations to teachers.

11. Week 12

   (a) Post self-evaluations by students.

   (b) Collection of evaluations from teachers and report cards for two grading periods.

12. Week 16

   Dissemination of abstracts to cluster members.

CHAPTER V

RESULTS, CONCLUSIONS, AND RECOMMENDATIONS

Upon completion of the implementation, data was compiled and compared. The results were as follows:

1. The first objective was for the male hearing impaired student to improve general conduct ratings on two six week report cards from needs improvement (N) to unsatisfactory (U) to satisfactory (S). The grading report at the end of the twelve week period was an (S-) satisfactory score, thereby reaching the goal with this improvement.
2. The second objective was to decrease the female student's audible inhalations per minute by 80%. The norm, which was established from a sample population (see Appendix A) was 32.5 The goal was set at 37.6 or 80% reduction based on the norm and the student's initial score of 47.0. The final score was 32.0 which not only exceeded the goal, but placed the student in the average range.
3. The third objective was improved self-image by both students as observed and documented by the teachers along with each student's responses to an informal questionnaire as well as discussions.

An informal pre - and - post rating scale, the Behavioral Academic Self-Esteem (BASE) form, was completed by the classroom teachers for each student. For the male student, self-confidence levels increased from 40% to 80% classification, with a total overall rating of 44% initially and 53% post-rating. Improvement in self-esteem corresponds with improved stress management skills. The female student's self-confidence levels increased from 60% to 80% on the classification table, with an overall initial rating of 80% and 73% post-rating. The decrease was in the student's initiative classification, lowering the post-rating averages. However, for the purpose of this practicum, the focus was the area of self-confidence, which increased for both students.

The Meadow/Kendall Social-Emotional Assessment Inventory for Deaf Students pre-test scores the scores area of self-image were 2.38 or the 20th percentile for the male and 2.75 or the 20th percentile for the female. Post-test scores for the male were identical and 2.95 or 30th

percentile increase for the female, meaning she reached the goal or increased to the next percentile while there was no change indicated for the male.

4. The fourth objective was for each student to reduce daily stress. One goal of this objective was to increase peripheral temperature to the normal range of 92 degrees to 96 degrees. This goal was not met by either student, yet improvement was made by both students. The male student experienced a 2.2 degree average increase, which can be seen on the summary chart (Appendix D), while the female student's average increase was 6.5 degrees.

Note the dip on the progress chart (Appendix D) for the female student at week seven. The student reported very cold temperatures within the household during home relaxation exercises which most likely affected the average and overall results. Additionally, a decrease in temperature during week eleven graphing of temperature and increased self-reported relaxation levels could be attributed to reported headache and upset stomach by the male student.

The second goal of this objective was to decrease the electrodermal response from the initial baseline to final baseline by 50%. The male's response decreased by 52% based on the beginning mean average of 9.6 and final mean average of 4.6, thus meeting the goal. The female's responses decreased by 19% based on the beginning mean average of 10.6 and final mean average of 8.6, thus not meeting this goal.

The third goal of this objective was to decrease self-reported stress, based on a scale of 0 (no stress) to 10 (extreme stress), to the lower limits, or the 0 to 5 range. As the averages on the summary chart indicate, both students average reports were quite low, thus meeting this goal (See Appendix D for the three month session summaries)

The fourth goal of this objective called for a reduction of scores to nineteen on the Taylor Manifest Anxiety Scale. A score of nineteen indicates no more stress than an average person. The male's score decreased to 22, but did not meet the goal. The female's score was below nineteen

on the pre-test with a score of eight and post-test score of fourteen. Even though an increase in anxiety was indicated, it was still below the goal.

SUMMARY CHART OF GOALS AND RESULTS

Expected Behavior	Evaluation Tool	Standards of of Performance	Results
1. improved behavior (male)	two six week report cards	from "U" to "N" to "S"	1st 6 weeks Contribution-U (unsatisfactory) implementation-U (unsatisfactory) 2nd 6 weeks- U (unsatisfactory) 3rd 6 weeks- S (satisfactory)
2. decreased audible inhalations (female)	post assessments by speech therapist	decreased by 80% (see Appendix A)	norm = 32.5 Beginning Score = 47.0 Goal = 37.6 Final score = 32.0
3. improved self-image (both students)	Meadow/Kendall assesment inventory post-test by teacher	increase to the next 10th percentile in post assesement	(Male) Beginning Score = 2.38 (20th percentile) Final Score = 2.38 (20th percentile) (Female) Beginning score = 2.75 (20th percentile) Finale score = 2.95 (30th percentile)
4. reduction of daily stress (both students)	(a) weekly chart of temperature feedback per session	(a) average increase of peripheral temperature to normal range of 92 degrees-96 degrees	(a) (Male Range = 75 - 94 Beginning average = 84.2 Final average = 86.4 (Female) Range = 84 - 95 Beginning average = 84.1 Final average = 90.6
	(b) weekly chart of Electrodermal Responses (EDR) per session	(b) decrease from individual baseline by 50%	(b) (Male) Range = 1.5 - 20.0 Beginning average =9.6 Final average = 4.6 (Female) Range = 1.5 - 20.0 Beginning average = 10.6 Final average 8.6
	(c) pre-and-post session self-report by students	(c) decrease to lower limits of scale (0-10) range)	(c) (Male) Beginning average = 4.0 Final average = 2.6 (Female) Beginning average = 3.8 Final average = 3.2

SUMMARY CHART OF GOALS AND RESULTS CONTINUED

Expected Behavior	Evaluation Tool	Standards of of Performance	Results
	(d) Taylor Manifest Anxiety Scale post-test by students	(d) reduction of score to 19 (no more stress than average person)	(d) (Male) Beginning average = 24 Final average = 22 (Female) Beginning average = 8 Final average = 14

Prior to the implementation of biofeedback and stress management, the two students were in agreement to the three month project with enthusiasm. They were both very receptive to being connected to the instruments several times each week, plus doing the homework assignments and followed through very well.

In order to assure that the homework assignments were turned in on schedule, prizes consisting of packets of trail mix and sugarless gum were dispensed.

At one point during the implementation, the EDR instrument failed, requiring reordering from Canada which took one week to receive. Fortunately, this occurred prior to spring break, which kept the project on schedule.

As a whole, the implementation was successful. Both students observed their abilities to "control" their nervous and vascular systems. Even though some goals were not achieved, there were definite increases towards overall improvement. Perhaps these students would respond more rapidly with usage of a variety of visual feedback which larger and less mobile instruments provide at this time. Such instrumentation will most likely become more available in the future.

This practicum has been discussed with the lead

teacher for the county's hearing impaired program. A copy will be sent to her as well as the superintendent for exceptional student education, the two speech and language pathologists, the two classroom teachers and principals of both school settings. Abstracts will be provided for each cluster member.

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APPENDIX A

Establishing Norms for Audible Inhalations Per Minute Using Twelve Sixth Grade Students with Two Separate Speech Therapists in Two Different Settings - All Reading A Pre-Selected Passage From the County Adopted Fourth Grade Reader

Speech Therapist's A Students		Speech Therapist's B Students	
	Total Inhalations		Total Inhalations
Student #1	37	Student #1	26
Student #2	41	Student #2	36
Student #3	35	Student #3	28
Student #4	31	Student #4	47
Student #5	30	Student #5	44
Student #6	35	Student #6	29

Average inhalations	Average inhalations
35 per 350 words	30 per 350 words
10 per 100 words	12 per 100 words

Overall average = 32.5

APPENDIX B

Stress Level — 0-10 (relaxation to tension)
Beginning:
End :

Temperature
Beginning:
End:

Student's Name:

NON-VERBAL SELF-REPORT FORM

Put an "X" on the part of your body that feels tense.

APPENDIX C

Name _____ Date _____

I practiced for _____ minutes. I put the temperature on:

right hand _____
left hand _____

My temperature started at _____.

My highest temperature was _____.

To help self relax I used: slow deep breathing
relaxation phrases
body scan
(what) imagery

During the practice my body (circle) felt: very relaxed
somewhat relaxed
not relaxed

During the practice my mind felt: Very relaxed
Somewhat relaxed
Not relaxed

After the practice I felt: Very Relaxed
Somewhat Relaxed
Not relaxed

Today I felt: (circle)

wonderful	sad	good	healthy
happy	mad	glad	angry
dumb	silly	smart	sick
loving	mean	kind	relaxed

Right now I feel:

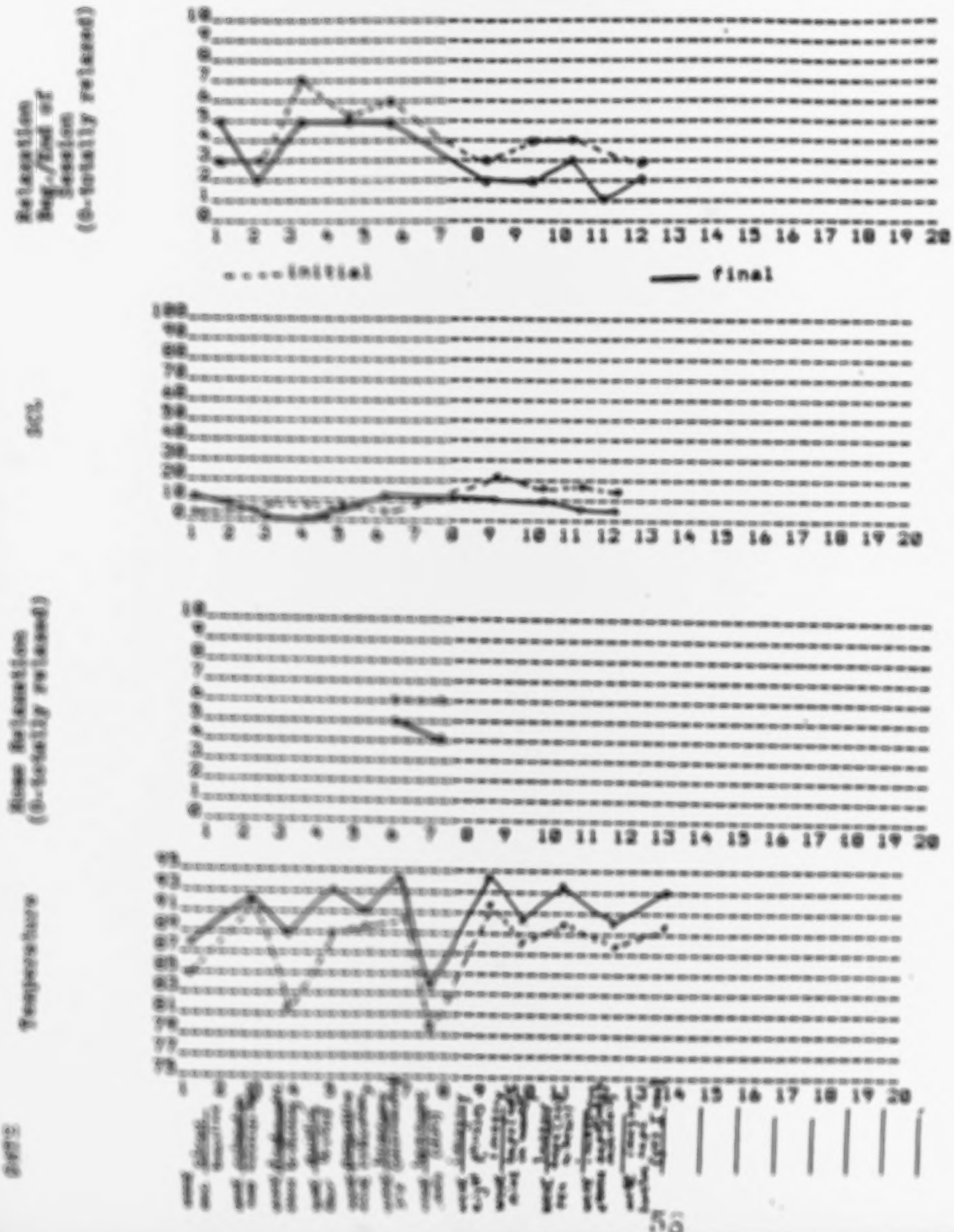
wonderful	sad	good	healthy
happy	mad	glad	angry
hurt	dumb	silly	smart
sick	loving	mean	kind
relaxed			

I will use imagery and relaxation before falling asleep. _____

APPENDIX D

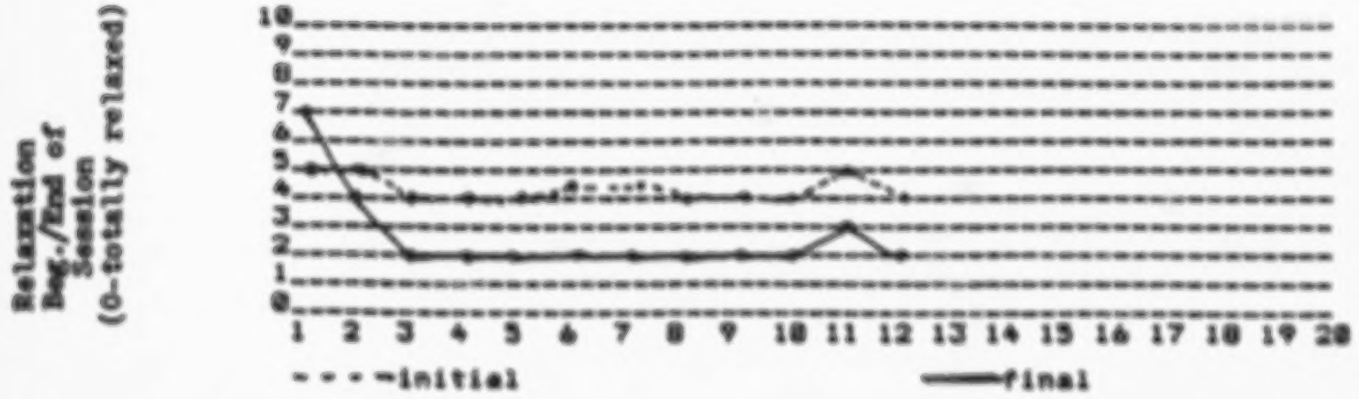
Female...Sixth grader

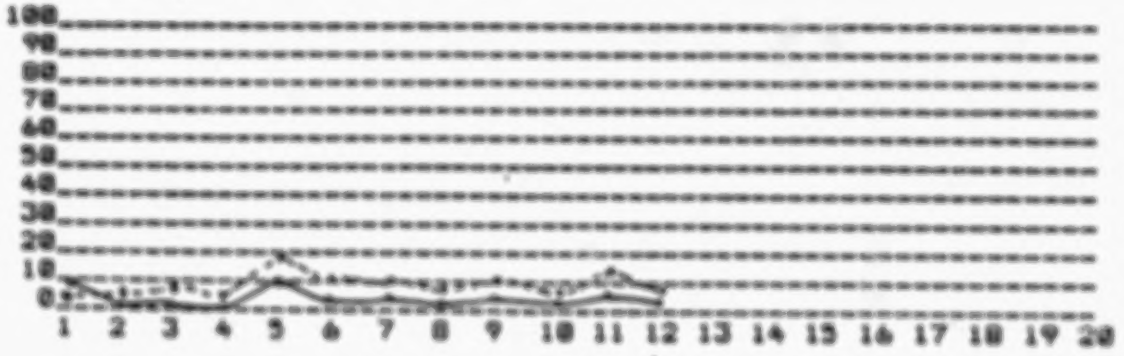
BIOFEEDBACK PROGRESS GRAPH

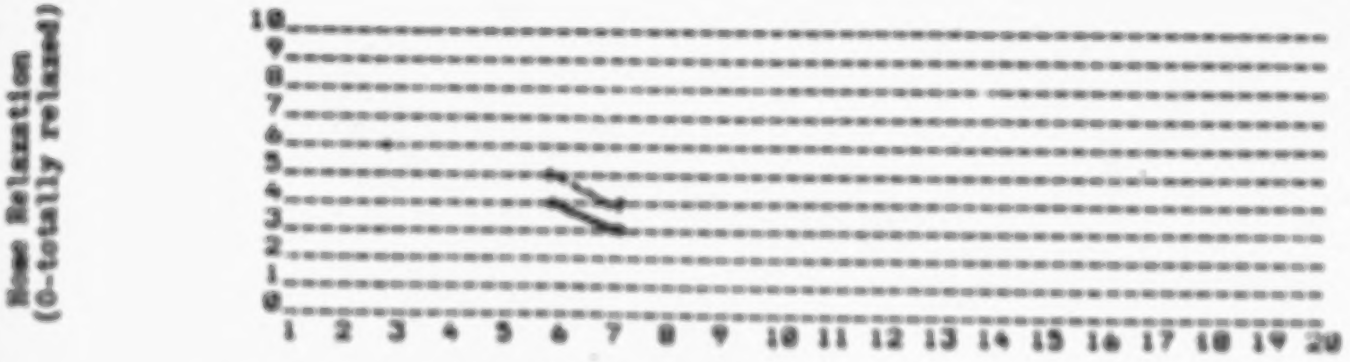


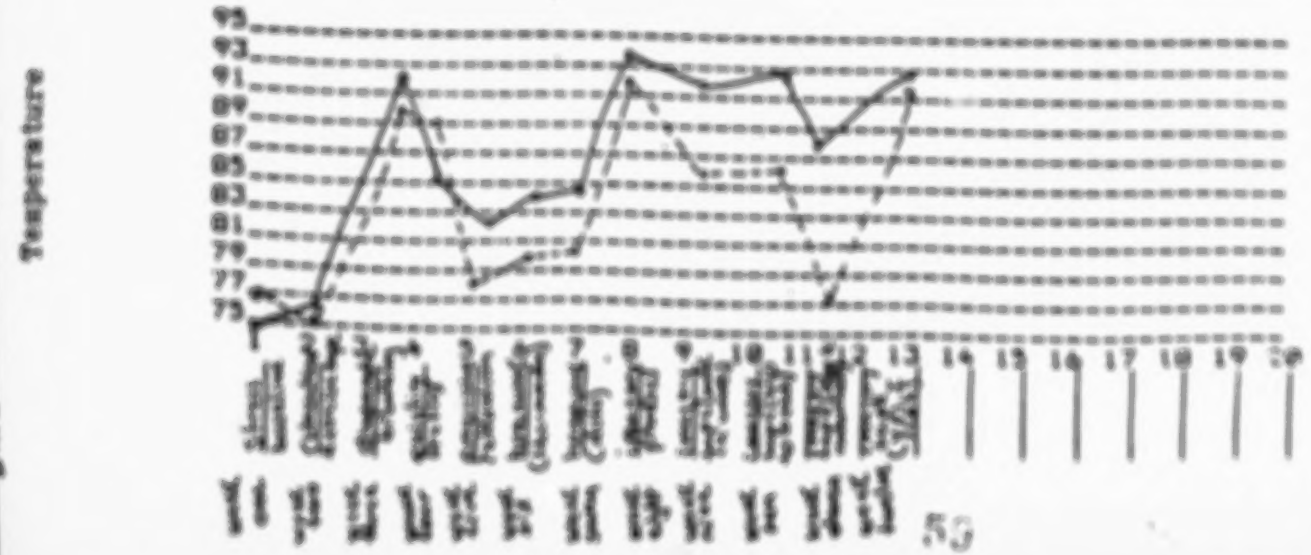
Male sixth grader

BIOFEEDBACK PROGRESS GRAPH









APPENDIX E

RELAXATION AND IMAGERY PHRASES

I FEEL QUITE QUIET

I AM BEGINNING TO FEEL QUITE RELAXED

MY FEET FEEL HEAVY AND RELAXED

MY ANKLES, MY KNEES, AND MY HIPS FEEL HEAVY, RELAXED AND COMFORTABLE

MY STOMACH AND THE WHOLE MIDDLE PART OF MY BODY FEEL RELAXED AND CALM

MY HANDS, MY ARMS, AND MY SHOULDERS, FEEL HEAVY, RELAXED AND COMFORTABLE

MY NECK, MY JAWS AND MY FOREHEAD FEEL RELAXED. THEY FEEL COMFORTABLE AND SMOOTH

MY WHOLE BODY FEELS CALM, HEAVY, COMFORTABLE AND RELAXED

MY WHOLE BODY IS RELAXED AND MY HANDS ARE WARM, RELAXED AND WARM

WARMTH AND HEAVINESS ARE FLOWING INTO MY HANDS, THEY ARE HEAVY AND WARM

I CAN FEEL THE WARMTH AND HEAVINESS FLOWING DOWN MY ARMS INTO MY HANDS

I AM A LIMP RAG DOLL WITH HEAVY ARMS AND LEGS AND A SMILE ON MY FACE

I AM A LIMP RAG DOLL WITH HEAVY ARMS AND LEGS, AND MY MIND IS CALM AND PEACEFUL

MY WHOLE BODY IS RELAXED, RELAXED, RELAXED AND MY HANDS ARE WARM, WARM, WARM

I AM RELAXED AND CHEERFUL AND FULL OF LIFE

APPENDIX F

Relaxation and Hand Warming Phrases

_____ I am beginning to feel quite quiet.

_____ I am beginning to feel relaxed.

_____ My feet feel heavy and relaxed

_____ My ankles, my knees and my hips feel heavy, relaxed and comfortable.

_____ My stomach and the whole central part of my body feel relaxed and quiet.

_____ My neck, my jaw and my forehead feel relaxed. They feel comfortable and smooth.

_____ My whole body is beginning to feel quiet, heavy and relaxed.

_____ My whole body is relaxing and my hands are becoming heavy and relaxed.

_____ My arms and hands are heavy, relaxed and heavy.

_____ My hands are heavy and warm.

_____ Warmth and heaviness are flowing into my hands, they are heavy and warm.

_____ Continue alone for a minute.

_____ My whole body feels quiet, comfortable and relaxed.

_____ My mind is becoming calm and quiet.

_____ I am beginning to feel peaceful and relaxed.

_____ I can feel my mind and body becoming relaxed and peaceful.

_____ Continue alone for a minute.

APPENDIX G

PROGRESSIVE RELAXATION EXERCISES

1. Select a comfortable setting or reclining position.
2. Loosen any tight clothing.
3. Now tense your toes and feet (curl the toes, turn feet in and out). Hold the tension, study the tension, then relax your toes and feet.
4. Now tense your lower legs, knees and thighs. Hold the tension, study the tension, then relax your legs.
5. Now tense your hips. Hold and study the tension. Relax your hips.
6. Tense your stomach. Hold the tension, feel the tension, and relax.
7. Now tense your chest. Hold and study the tension. Relax, take a deep breath, and exhale slowly.
8. Tense the fingers and hands. Hold the tension, study the tension, and then relax.
9. Tense your lower arms, elbows and upper arms. Hold it, study it, and then relax.
10. Now tense the shoulders. Tense, hold and study the tension, and then relax.
11. Now tense your entire face. Tighten your face so that you feel the tension in your facial muscles. Study the tension and then relax.
12. Now try to tense every muscle in your body. Hold it, study it, and then relax.
13. Continue sitting or reclining for a few minutes, feeling the relaxation flowing throughout your body. Know the difference between muscles which are tense and muscles which are relaxed.
14. Now stretch, smile inside and then outside and continue with your activities.

APPENDIX H

Consent for Student Participation in Biofeedback
(Reducing Stress in Speech and Reading)

Students Name_____Date of Birth_____Age____

Address _____

School_____

I give consent and hereby agree that _____may participate in a biofeedback study of selected hearing impaired students. I understand any individual data obtained shall be made available to all participants.

Parent_____

Tonyia J. Litus
Hearing Resource Clinician

APPENDIX I

Stress appears to be increasing in all aspects of our society, including our school age children. Societal changes, along with increased divorce rates, upward mobility, frequent moves, increased competition, etc., could be possible sources of stress to many families, children included.

With hearing impaired populations, these stressors apply along with the additional stress involving communication difficulties which is often overwhelming to the individual and their families, giving them unique sources of stress as compared to the hearing population.

I am enclosing summaries of several recent studies involving stress and school age children, as to the approaches used and the results that were obtained.

My intent is to monitor frontalis muscles tension using the electromyograph (noninvasive); skin resistance using the galvonic skin response device (noninvasive); and finally to monitor skin temperature for skin resistance (also noninvasive). These auditory devices translate signals in both auditory and visual display modes. A catalog describing these instruments is also enclosed.

Title: Case Studies Utilizing Biofeedback Relaxation Training and Modification of Speech and Reading Involving School Age Hearing Impaired Student.

Purpose:

The purpose of this study is to determine whether hearing impaired school age children trained to EMG, GSR and temperature biofeedback assisted stress management can demonstrate control of stress responses as applied to speech and reading. Further, for those students who have been unable to control emotions related to anger and frustration, to train stress management involving specific stressors.

Initially, students will become aware of the difference between feeling stressed and feeling relaxed relaxed through activities taught at school and practiced in the classroom, as well as at home.

Students will learn how to monitor these stress/relaxed states while observing feedback displays.

Students will learn how to control the learned stress/relaxed state while reading aloud along with improved production of speech.

Students will learn how to more effectively deal with personal stressors (interacting with negative situations, ex. testing, confrontations with peer group, teachers, and family).